

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Liu et al.

Application No.: 10/634,964

Filed: 2/27/2003

Title: CHEMICAL MECHANICAL
PLANARIZATION COMPOSITIONS FOR
REDUCING EROSION IN
SEMICONDUCTOR WAFERS

Attorney Docket No.: 02039US

Art Unit:
1765

Examiner:
Patricia Ann George

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Commissioner for Patents

P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. § 1.132

That I Zhendong Liu declare the following:

1) That I am a current employee of Rohm and Haas Electronic Materials CMP Inc. (fka Rodel, Inc.); and that I have been employed at Rohm and Haas Electronic Materials for over four years in the role of a research chemist.

2) That my professional qualifications include the following:

Ph.D. University of California, Berkeley, 2001
Major: Hydrometallurgy
Minors: Chemistry and Environmental Engineering

Block Grant Fellowship, 1997-1998
Jane Lewis Fellowship, 1998-2001

M.S. Beijing Graduate School, China University of Mining and Technology, 1997
Major: Mineral Processing Engineering

B.S. Huainan Mining Institute, 1994
Major: Mineral Processing Engineering

3) That I co-authored the following articles related to Chemical Mechanical Polishing:

Z. Liu et al., "Electrochemical Testing of Tantalum and Copper in Chemical Mechanical Polishing Slurries", ECS Fall Meeting, Los Angles, October 2005.

Z. Liu et al., "Copper Removal Rate Control in Chemical Mechanical Polishing of Barrier Materials, *CMP-MIC*, February 2005.

Z. Liu et al., "Copper CMP Barrier Slurries for Ultra-low k Applications", *CMP-MIC*, February 2004.

Z. Liu et al., "Development of Novel Barrier Slurries for Ultra-low k Applications", *CAMP Annual Meeting*, August 2003.

4) That I have reviewed US Pat. Appln. No. 10/634,964 ('964), filed August 5, 2003; the USPTO action mailed November 18, 2005; and Sun et al. (US Pat. No. 6,709,316) and Yano et al. (US Pat. No. 6,375,545).

5) That Sun et al. at Col. 6, line 33 to Col. 8, line 39 disclose a first-step copper slurry designed for removing copper from semiconductor substrates. First-step copper slurries typically remove copper at a rate of 2,000 to 10,000 Å/min. Furthermore, these slurries ideally have a zero removal rate for barrier materials, such as tantalum and tantalum nitride.

6) That a skilled slurry design scientist would not expect or attempt to use a first-step copper slurry for second-step polishing that requires high removal rates of barrier materials, such as tantalum nitride.

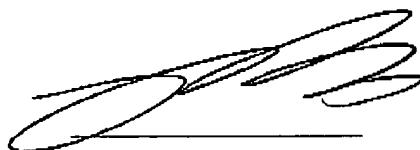
7) That Sun et al. at Col. 8, line 40 to Col. 9, line 65 disclose a barrier removal slurry that operates at a pH of about 4 to 12 and preferably at a pH of about 8 to 12.

8) That Yano et al. disclose at Col. 9, lines 20 to 29 the use of polymeric particles and at Col. 3, lines 8 to 29, the use of surfactant-coated polymeric particles. Yano et al. do not disclose the addition of water soluble carboxylic acid polymers to a slurry having a pH less than 4 with the pH adjusted with an inorganic acid and the slurry being useful for tantalum nitride removal.

9) That as illustrated by Examples 1 to 4 and Figures 1 to 3 of the pending application, Applicants have discovered that the addition of water soluble carboxylic acid polymers to a barrier slurry having a pH less than 4 with the pH adjusted with an inorganic acid can improve dielectric erosion when polishing patterned wafers.

10) That in my opinion, the combined Sun et al. and Yano et al. references do not disclose or suggest the addition of water soluble carboxylic acid polymers to a barrier slurry having a pH less than 4 with the pH adjusted with an inorganic acid.

11) That I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Dr. Zhendong Liu

February 10, 2006